Endoscopic Pyloromyotomy: Overview and Early Experience

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Introduction
1. Gastroparesis
Gastroparesis is defined as a syndrome of delayed gastric emptying in the absence of mechanical obstruction and cardinal symptoms including nausea, vomiting, bloating, early satiety, postprandial fullness, and upper abdominal pain without the evidence of mechanical obstruction.1 Idiopathic, Diabetic, and postsurgical gastroparesis are the most common causes.2

2. Post-vagotomy Gastroparesis
Post-vagotomy Gastroparesis occurs in 15-50% of patients following esophagectomy with gastric interposition, and results in aspiration pneumonia, persistent nausea, intolerance of oral intake, weight loss, and poor quality of life (QoL).3 Subsequently, this can contribute to significant morbidity and mortality in these patients. Currently, the efficacy of pyloric drainage procedures to prevent post-vagotomy gastroparesis remains controversial.

3. Anatomy of Pylorus
The pylorus, the distal end of the stomach which is marked by thickening of the circular smooth muscle layer, acts as a valve between the stomach and the duodenum and regulates gastric emptying. Innervation of the pylorus is through the terminal branches of the right and left vagus nerves. Any injury to these nerves or denervation of the pylorus will result in delayed gastric emptying or pylorospasm4.

4. Surgical Management
1) Pyloroplasty (Heineke-Mikulicz pyloroplasty): Pyloroplasty consists of longitudinal incision and transverse suture. Longitudinal incision is done through the pylorus from the distal antrum to the proximal duodenum and is closed transversely to increase the diameter of the pyloric channel.5

2) Pyloromyotomy: Pyloromyotomy is a 1.0-1.5 cm vertical seromuscular incision in the pylorus. Generally suture is not necessary if mucosa remained uninjured.

The results of a recent meta-analysis demonstrated that pyloric drainage was associated with a non-significant trend toward earlier gastric emptying and reduced rates of anastomotic leak and pulmonary complications. In addition, despite the variety in the result of previous studies, pyloromyotomy, when compared to pyloroplasty, demonstrated a trend toward a reduction in complication rate and hospital stay.6-9

5. Endoscopic Management
1) Endoscopic Balloon dilation
Even though there are only a small number of studies to evaluate the effect of endoscopic balloon dilation (EBD), EBD seems effective for treatment of early or late delayed gastric emptying. However, the number of dilation session
varied between 1 and 5 times and there was no significant improvement in gastric emptying time in about 70% of patient. 9,10

2) Botulinum toxin injection

The effect of intrapyloric botulinum toxin injection is still controversial. This method was seen as a promising alternative in a few early studies as it transiently maintain an effect during the early postoperative period. However, in contrast, there have been studies reported that the use of intrapyloric botulinum injection lead to increased early and delayed complications and the requirement for endoscopic interventions in the pylorus. 11-15

3) Endoscopic pyloromyotomy

As a spin-off of Natural Orifice Translumenal Endoscopic Surgery (NOTES), the concept of submucosal endoscopy became widely spread, and subsequently, per-oral endoscopic myotomy (POEM) was performed in animal and clinical setting. Quickly, this technique was applied to the pylorus and the feasibility and efficacy of this technique has recently been demonstrated in a porcine model and a patient with diabetic gastroparesis. 16,17 Recently our group has reported the first human case of endoscopic pyloromyotomy for the patient with gastroparesis after esophagectomy. 18 The technique is similar with POEM and can be performed under conscious sedation.

(1) Creation of mucosal entry: saline solution mixed with indigo carmine is injected on the greater curvature side or anterior wall side 5cm proximal to the pylorus. About 1cm mucosal incision is made by using endoscopic knife.

(2) Submucosal tunneling: tunneling towards the pylorus is made until pyloric ring is identified. Unlike POEM, gastric antrum is wide and it is easy to lose direction, therefore frequent identification of direction of tunnel from outside tunnel is necessary.

(3) Pyloromyotomy: selective circular myotomy is done. The outer longitudinal muscle and serosa is intended to be preserved.

(4) Closure of mucosal entry: The mucosal entry is closed using endoscopic clips.

6. Early Clinical Experience

After the successful treatment in our first case with refractory gastroparesis, we continue to perform this procedure and eight cases was done from May 2013 to September 2014 in Yonsei University Severance Hospital, Seoul, Korea. The patients underwent endoscopic pyloromyotomy for gastroparesis due to esophagectomy (n=4) and diabetic gastroparesis (n=4). Delayed gastric emptying was defined by endoscopy and/or gastric emptying scintigraphy. Technical parameters including procedure time and complication were investigated. In addition, functional and symptomatic changes were investigated with gastric emptying scintigraphy, gastric outlet scoring system (GOOSS) and gastroparesis symptom questionnaire before and 1month after endoscopic pyloromyotomy. Mean procedure time was 49.5 (35-65) min and all procedure was performed under conscious sedation. There was no remarkable complication, but one peripyloric ulcer and one dumping syndrome. Median follow-up was 7 months (range 2-15). Symptoms such as vomiting, nausea and epigastric pain were significantly improved after endoscopic pyloromyotomy (p< 0.05). However early satiety, bloating and postprandial fullness did not show statistical significance. Mean pre- and post-myotomy GOOSS were 1.14 and 3.0, respectively (p< 0.05). Gastric emptying scintigraphy was performed in seven out of eight patients and mean pre- and post-myotomy T50 were 329.7 min and 146 min (p< 0.05).

Conclusion

Endoscopic pyloromyotomy is feasible and effective treatment modality for the patients with gastroparesis and may
be an alternative to the other endoscopic or surgical treatment in selected cases, such as refractory setting. Long-term follow-up data and prospective comparative study with conventional technique is required to establish its exact role and efficacy.

References